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1430983 COMPLETE SPECIFICATION

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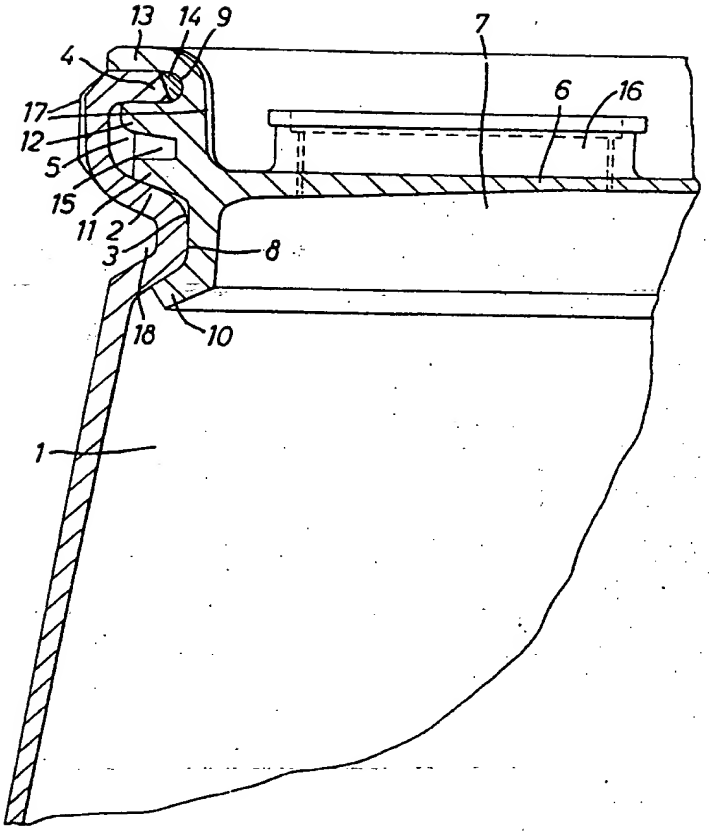

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(19)

(54) IMPROVEMENTS IN OR RELATING TO CONTAINER DRUMS

(71) We, GPG HOLDINGS LIMITED, of Cranford, Blackdown, Leamington Spa, Warwickshire and THERMO PLASTICS LIMITED, of Luton Road, Dunstable, Bedfordshire, both British Companies, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a container drum assembly and to a method of manufacturing such an assembly.

According to the present invention there is provided a container drum assembly comprising a thermo plastics drum body part having a wall forming a mouth and a closure member incorporating a bung opening and which is secured to the wall to close the mouth; in which the wall of the drum body part adjacent to the mouth is of substantially corrugated formation to provide a peripheral lip directed inwardly of the mouth and an inwardly directed internal peripheral protuberance spaced from the lip, said lip and protuberance forming therebetween an endless inner peripheral groove; and in which the closure member has an endless peripheral external flange portion and a peripheral skirt portion which portions are received within the mouth of the drum body part, said skirt and flange portions together forming an endless external peripheral channel shaped recess on the closure member prior to its assembly with the drum body part, and wherein the closure member is firmly engaged with the drum body part by location of its peripheral flange portion in the inner peripheral groove of the wall and simultaneous location of the internal peripheral protuberance of the drum wall in the external peripheral channel shaped recess of the closure member.

Further according to the present invention there is provided a method of manufacturing a container drum assembly as specified in the immediately preceding paragraph which comprises forming the drum part by blow moulding, locating the closure member at least partly within the mouth formed by the corrugated portion of the drum wall and engaging the peripheral flange portion of the closure member with the inner peripheral groove of the wall substantially simultaneously with engaging the internal peripheral protuberance of the drum wall with the external peripheral channel shaped recess of the closure member.

Container drums of plastics have hitherto been proposed which are produced as an integral unit by blow moulding. Conventionally container drums are provided with one or more bung holes which are usually located in a recessed top end of the drum so that that end provides a flat stacking surface. In an attempt to distribute stress throughout blow moulded drums when several are stacked, such drums are, in the majority of cases, moulded with substantially flat top and bottom ends and relatively large radii of curvature at the transition portions between the top and bottom ends and the side walls of the drums. Drums having their contours rounded in this manner and being moulded to present a relatively smooth profile on all sides can be very difficult to handle as compared with conventional metal drums of large capacity which are provided with recessed bottom ends which are enclosed by a folded edge. Although it has been proposed to provide plastics drums with moulded-in gripping recesses adjacent to one of their ends this generally affords only a limited grip for handling and also tends to weaken the drum. It has also been attempted to overcome the difficulty of handling plastics drums by providing them with so-called stretched crane rings on their top ends but these have not found general

acceptance since crane rings are not readily convenient for manual handling. Furthermore, the crane ring tends to have the effect of disrupting the plastics material in the end of its drum so that the container may not possess adequate impact strength in the event of it being dropped.

Bung holes when formed integral with a drum during the blow moulding process as aforementioned are unlikely to be produced with desirable accuracy in view of the shrinking of the plastics, the tensions which develop in the drum during its cooling after moulding and the difficulty of achieving precision in forming a bung hole. In the event that the bung holes are malformed as above mentioned, for example by being mis-shapen, unless the container drum is to be scrapped it becomes necessary to provide special fittings to achieve satisfactory closure of the bung hole and such fittings may not readily permit the use of conventional devices for filling, sealing and emptying of the drums. Furthermore, the top and bottom ends of blow moulded drums while being ideally flat are generally formed with an undulating or uneven surface for similar reasons of shrinkage and the development of tensions in the plastics material as above mentioned. Such uneven surfaces may not be suitable for the attachment of advertising legends, instructions for use and the like and are unlikely to permit the use of a vacuum lift device.

A further disadvantage of integrally formed blow moulded container drums results from their process of production during which a parison of the plastics material is squeezed off at both ends, those ends are welded and the parison is then blown against the inner wall of the mould. As a result of this squeezing technique at the two ends of the parison, the latter is unlikely to be rotationally symmetrical about its longitudinal axis (which it would have been during extrusion of the parison). As a consequence during the blowing of the parison differences occur in wall thickness due to uneven stretching of the plastics material. These differences may be in the order of magnitude of 1:3. More particularly, these differences in wall thickness are likely to be in the extreme in the partition region of the wall which extends between the side of the drum and an end which may contain a bung hole since the plastics material will undergo considerable expansion. In an attempt to alleviate this difficulty and ensure that blow moulded drums have a wall thickness which, at its minimum, will satisfy the requirements of the drum in practice, a dis-proportionally high quantity of plastics material is used in the parison. Such a technique besides adding considerably to the cost of production also tends to reduce the efficiency of the product.

The container drum assembly in accordance with the present invention may alleviate the above mentioned disadvantages generally associated with container drums which are blow moulded as an integral unit. More particularly, the drum body part may readily be blow moulded as a single unit so that it has a substantially uniform wall thickness. This may be achieved since the plastics parison for the drum body part need only be squeezed off at the end remote from that at which the mouth is to be formed and so the plastics material of the parison can present a good flow distribution during blowing and as such a substantially uniform wall thickness can be produced relatively quickly. In addition, the closure member which is secured in the mouth of the drum body part can be pre-formed to a higher degree of accuracy so that especially the bung hole provided in the closure member will meet specified standards.

Generally the drum body part will be moulded in a thermo plastics material having a high molecular density such as polyethylene and advantageously the drum body part is produced as aforementioned by a blow moulding process in which the parison is squeezed off or sealed at one end only while the other end corresponding to the mouth of the drum part is maintained open. Usually the corrugated portion of the drum body part wall will be formed integral with the remaining portion of the drum body part during moulding of the latter.

In forming the corrugated portion it will be apparent that there will be formed on the outer side of the corrugated portion an external peripheral groove which coincides with the internal peripheral protuberance and this external peripheral groove may provide an adequate recess by which the drum assembly can be gripped for the purpose of handling. This external "gripping" groove may be accentuated by an adjacent peripheral protuberance which will be presented on the outer side of the corrugated portion and correspond to the inner peripheral groove on such portion. If required, the external face of the outer peripheral protuberance on the corrugated portion can be provided with a peripherally spaced array of small ribs which may assist in achieving a firm grip during manual handling. A preferred and convenient form for the corrugated portion is that of substantially "S" shape in section through the wall thickness of that portion whereby the upper tail end of the S-shape corresponds to the inwardly directed peripheral lip.

Preferably the closure member is produced in plastics material by injection moulding to include integrally formed bung holes. The closure member may have a second endless

external peripheral channel shaped recess in which is received the inwardly directed lip of the drum wall. To effect a seal between the closure member and drum body part this second peripheral recess of the closure member may contain a gasket or sealing ring which is retained therein (desirably under compression) by the inwardly directed lip which is also received in the second peripheral recess. Usually such a gasket will have a round cross section and be of traditional elastomeric material although other gaskets or sealing rings such as of foam rubber or foamed polyurethane are likely to prove efficient.

During the manufacture of the container drum assembly of the present invention it is preferred that the closure member is fitted within the mouth of the drum body part while the corrugated portion of the drum wall is above ambient temperature. The corrugated portion may then be cooled to shrink that portion and effect a firm engagement between the closure member and drum body part. With the peripheral flange portion of the closure member firmly engaged in the inner peripheral groove of the drum wall and the internal peripheral protuberance of the drum wall engaged in the external peripheral channel shaped recess of the closure member a rim of considerable strength will be presented on the outer surface of the drum assembly which extends around the periphery at one end thereof. The strength and rigidity afforded by this rim may present an efficient portion for engagement during handling and is likely to be capable of absorbing considerable impact without damage in the event of the drum assembly being accidentally dropped.

The manufacture of the container drum assembly by use of the shrinkage technique discussed above is convenient since it effectively utilises the fact that blow moulded hollow bodies of thermo plastics material have, after their blow moulding, a considerable linear delayed shrinkage the extent of which can be determined to a reasonable degree of accuracy by knowledge and control of the ejection temperature and of the wall thickness (the latter of which may amount to approximately 3% of the diameter of the drum in the case of drums having circular cross section). It has been found that for a container drum assembly of the present invention having a circular mouth of approximately 500 mm. diameter opening, an engagement between the corrugated portion and the closure member of approximately 7 to 8 mm. extent is adequate for achieving a reasonably safe joint between the two parts.

One embodiment of a container drum assembly constructed in accordance with the present invention will now be described, by way of example only, with reference to the accompanying illustrative drawing which shows part of the assembly in section.

The container drum assembly comprises a thermo plastics drum body part 1 which is blow moulded as an integral unit to be of substantially circular section and have a closed base (not shown) and a mouth formed by a corrugated portion 2 of the drum body part side wall. The mouth of the drum body part is closed by a closure member 6 (conveniently referred to as a "cap") which is partly received therein. The cap 6 is injection moulded in plastics material and incorporates a bung hole 16 through which the drum is intended to be filled and emptied and which is sealable by a bung (not shown).

The corrugated portion 2 which is formed during the blow moulding of the drum part is of substantially "S"-shape in section through the wall thickness of the drum part so that the upper tail end of the "S"-shape provides a peripheral lip 4 which is directed radially inwardly of the mouth while a lower portion of the "S"-shape provides an inwardly directed internal convex peripheral protuberance 3. Formed between the internal protuberance 3 and lip 4 is an endless inner peripheral groove 5.

The cap 6 has an endless external flange portion which comprises two circumferentially spaced and parallel ribs 11 and 12 extending radially outwardly relative to the cap and which are braced together by an array of bridging portions 15 which portions are circumferentially spaced around the cap. Incorporated in the cap as moulded and extending downwardly thereof is a peripheral skirt 7 having an outwardly directed foot portion 10. This skirt, with its foot portion 10 defines, together with the rib 11, a first external circumferential channel shaped recess 8 on the cap. A second external circumferential recess 9 is provided on the cap between the rib 12 and an uppermost flange 13 which provides a flat top to the cap. Located in the second recess 9 is an "O" ring sealing member 14.

With the cap 6 assembled in the drum part 1 the peripheral flange portion formed by the ribs 11 and 12 of the cap are closely received in the inner groove 5 of the drum wall while the peripheral protuberance 8 of the drum wall is simultaneously closely received in the circumferential recess 3 of the cap. In addition the second recess 9 of the cap closely receives the inwardly directed lip 4 of the drum wall to retain the ring member 14. To achieve such assembly the appropriate portion of the cap 6 is preferably inserted into the mouth of the drum body part 1 while the mouth is in a thermally expanded condition (which is desirably achieved immediately after blow moulding of the drum body part and while the latter

is at a temperature above ambient). By assembling the drum in this manner it will be appreciated that as the corrugated portion of the drum body part cools it will contract radially and thereby urge the lip 4 and protuberance 8 into close engagement with their respectively associated recesses on the cap while the flange portion presented by the ribs 11 and 12 is urged into engagement with the recess 5 in the drum wall as a result of the radially inwardly directed compression forces which are applied to the cap from the drum wall. The reaction on the ribs 11 and 12 is in a sense to urge these towards each other and the bridging portions 15 are provided to alleviate such movement. Consequently the cap will be firmly secured against outward movement relative to the drum body part by virtue of its rib 12 being anchored beneath the lip 4 and the foot portion 10 of the skirt being anchored beneath the circumferential protuberance 8 of the drum wall while compression of the ring member 14 in its recess ensures an effective seal for the cap.

It will be noted that the bung hole 16 is moulded into the cap 6 in a recess to lie below the flange 13 thereby permitting the flange 13 to present a substantially flat face to facilitate stacking. Conveniently the peripheral side wall for the recess of the cap 6 within which the bung hole 16 is located and also the external face of the drum wall over its portion forming the groove 5 is provided with a peripherally spaced array of gripping ribs 17 to facilitate handling of the assembly. It will be particularly noticed from the drawing that the circumferential outer protuberance on the drum wall corresponding to the groove 5 and the underlying recess 18 corresponding to the internal circumferential protuberance 8 of the drum wall provide effective gripping positions for manual handling of the assembly and these gripping positions will generally have a relatively solid feel by virtue of the internal reinforcement presented by the co-operating parts of the cap to the drum wall.

WHAT WE CLAIM IS:—

1. A container drum assembly comprising a thermo plastics drum body part having a wall forming a mouth and a closure member incorporating a bung opening and which is secured to the wall to close the mouth; in which the wall of the drum body part adjacent to the mouth is of substantially corrugated formation to provide a peripheral lip directed inwardly of the mouth and an inwardly directed internal peripheral protuberance spaced from the lip, said lip and protuberance forming therebetween an endless inner peripheral groove; and in which the closure member has an endless peripheral external flange portion and a peripheral skirt portion which portions are received within the mouth of the drum body part, said skirt and flange portions together forming an endless external peripheral channel shaped recess on the closure member prior to its assembly with the drum body part, and wherein the closure member is firmly engaged with the drum body part by location of its peripheral flange portion in the inner peripheral groove of the wall and simultaneous location of the internal peripheral protuberance of the drum wall in the external peripheral channel shaped recess of the closure member.

2. A container drum assembly as claimed in claim 1 in which the corrugated portion of the drum wall is formed integral with the remaining portion of the drum body part.

3. A container drum assembly as claimed in either claim 1 or claim 2 in which the drum body part is blow moulded.

4. A container drum assembly as claimed in any one of the preceding claims in which the corrugated portion of the drum wall is substantially "S"-shaped in section through the thickness of the wall.

5. A container drum assembly as claimed in any one of the preceding claims in which the closure member has a second endless external peripheral channel shaped recess in which is received the inwardly directed lip of the drum wall.

6. A container drum assembly as claimed in claim 5 in which the second channel shaped recess of the closure member contains a gasket or sealing ring which is retained therein by the inwardly directed lip.

7. A container drum assembly as claimed in any one of the preceding claims in which the peripheral external flange portion of the closure member comprises at least two substantially parallel and spaced peripheral ribs which are braced together by an array of bridging parts peripherally spaced around the closure member to alleviate movement of said ribs towards each other.

8. A container drum assembly as claimed in any one of the preceding claims in which the corrugated portion of the drum wall engages with the closure member to apply inwardly directed compression forces to the closure member.

9. A container drum assembly as claimed in claim 8 in which the corrugated portion of the drum wall is shrunk into engagement with the closure member.

10. A container drum assembly as claimed in any one of the preceding claims in which the closure member is moulded in plastics material.

11. A container drum assembly as claimed in claim 1 and substantially as herein described with reference to the accompanying illustrative drawing.

12. A method of manufacturing a con-

tainer drum assembly as claimed in claim 1 which comprises forming the drum body part by blow moulding, locating the closure member at least partly within the mouth formed by the corrugated portion of the drum wall and engaging the peripheral flange portion of the cap with the inner peripheral groove of the wall substantially simultaneously with engaging the internal peripheral protuberance of the drum wall with the external peripheral channel shaped recess of the closure member.

13. A method as claimed in claim 12 which comprises locating the closure member at least partly within the mouth while the corrugated portion of the drum wall is above ambient temperature and cooling said corrugated portion to shrink that portion and effect a firm engagement between the closure member and drum body part.

14. A method of manufacturing a container drum assembly as claimed in claim 12 and substantially as herein described.

15. A container drum assembly when produced by the method as claimed in any one of claims 12 to 14.

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